After a relatively quiet 2014 weather year, our most significant storm with greatest impact was a powerful prolonged heavy wet snow event from December 9th through December 11th. Snowfall ranged from only a couple inches across the Connecticut River Valley to almost two feet near Warren, Vt. Click here for a complete listing of storm total snowfall for the event. In addition, figure A below shows the North Country storm total snowfall ending at 5 PM on December 11th. This heavy wet snowfall contain plenty of water with total precipitation amounts ranging from 1 to 3 inches across the region, with a COCORAHS (Community Collaborative Rain, Hail, and Snow Network)observer reporting up to 5.65 inches 3 Northwest of Waterbury, Vt. The snow to liquid ratios ranged from 5 to 7 inches of snow to 1 inch of rain, which lead to the snow sticking to trees and power lines. Click here for a complete listing of storm total precipitation. This storm produced over 100,000 people without power across the North Country and caused more damage to the power infrastructure than the January 1998 ice storm or hurricane Irene in August 2011. In addition to the heavy wet snowfall, significant ice accumulation up to 1 inch was observed near Barnard, VT, as well as the higher terrain of central and eastern Vermont during the event.

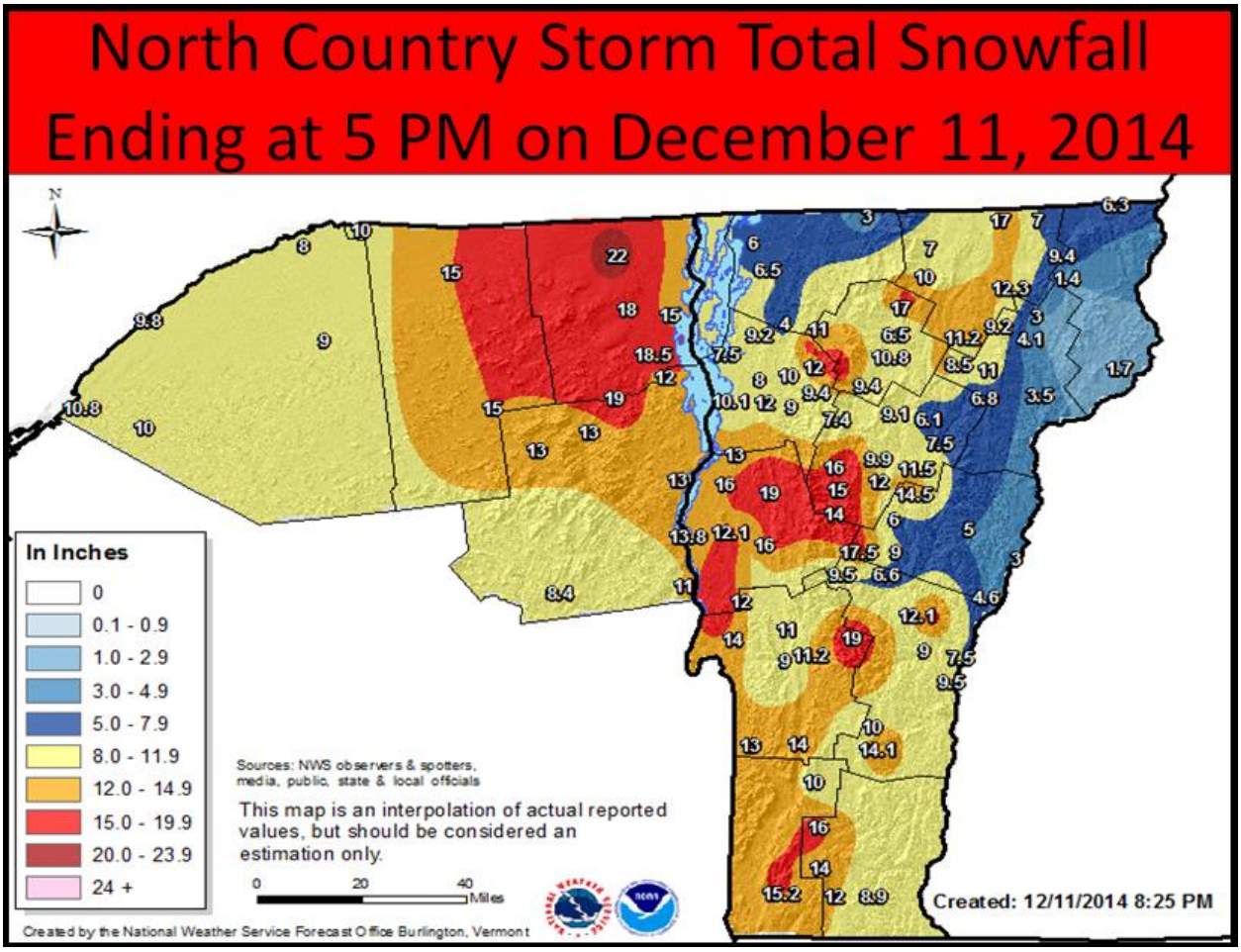

Figure A: North Country storm total snowfall from 9 December at 7:00 AM to 11 December 2014 ending at 5:00 PM.

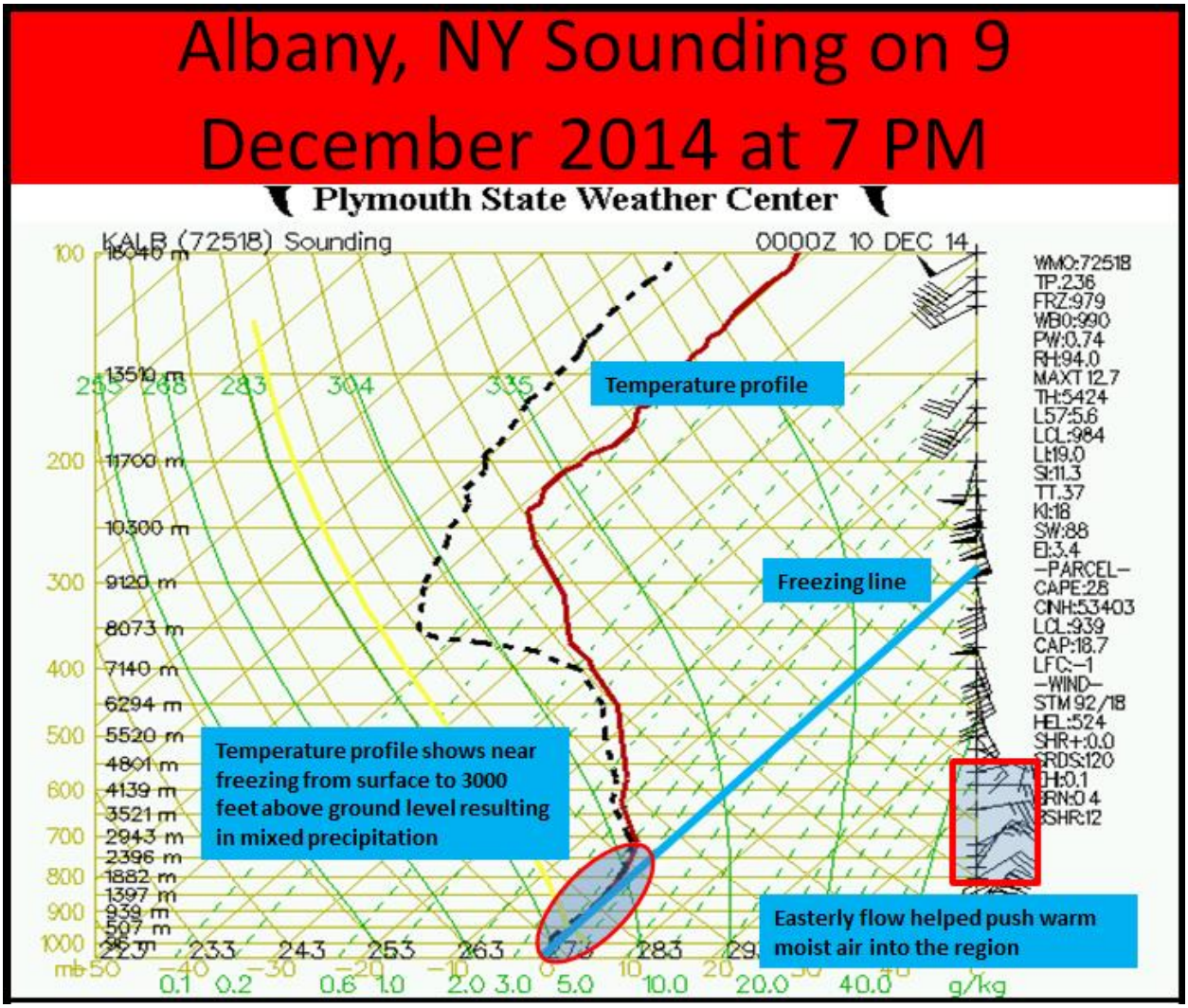

Figure B: Albany, New York sounding on 9 December 2014 at 7:00 PM.

The combination of a complex upper level pattern and associated surface low pressure track, along with very marginal temperatures profiles for frozen precipitation, made for an extremely difficult forecast. Figure B above shows the Albany, New York sounding on 9 December 2014 at 7:00 PM, which clearly shows a temperature profile from the surface to 3,000 feet AGL (above ground level) near freezing. This profile supports a very heavy wet snow event, especially as the heavier precipitation occurred with this storm and cooled the column just enough to support wet snow. Further north in Vermont, a cold layer of air was observed around 2,000 feet (AGL) supporting a mix of sleet and freezing rain. Also in Figure B you can see easterly winds between 4,000 feet and 8,000 feet (AGL) which helped pull deep Atlantic moisture into our region, along with a warm nose of air above 32°F. This warm nose of air impacted the Northeast Kingdom and Connecticut River Valley of Vermont, resulting in much less snowfall and more rain/mixed precipitation. Meanwhile, a much colder thermal profile was observed over northern New York, resulting in all snow with 1 to 2 feet accumulation over the Adirondack Mountains.

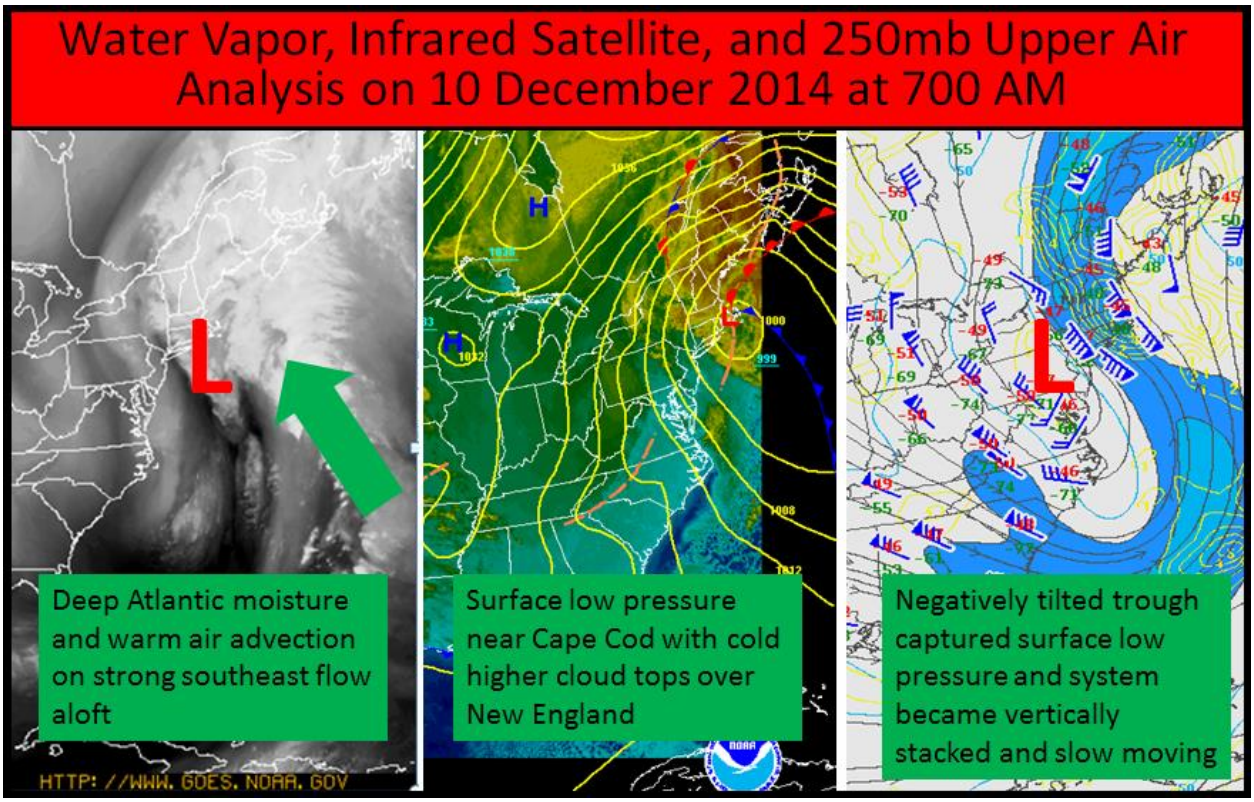

Figure C: Water vapor (left), Infrared Satellite (middle), and 250mb upper air analysis (right) on 10 December 2014 at 7:00 AM.

Not only did this powerful winter storm have a complicated thermal profile, but a very complex mid and upper level synoptic pattern developed along the northeast United States. This synoptic scale pattern featured a blocking high pressure over the Canadian Maritimes, while potent short wave energy enhanced a deep closed cyclonic circulation off the mid-Atlantic Coast ,helping develop surface low pressure just east of Cape Hatteras, NC on the evening of December 8th. The system became vertically stacked from the surface through 250mb, and only moved slowly northeast toward the Gulf of Maine by December 11th, as a blocking high remained anchored over the north Atlantic. The counterclockwise circulation around low pressure pulled plenty of deep Atlantic moisture and warm air back into the North Country, resulting in several rounds of heavy precipitation, along with a prolonged period of backside upslope snowfall. Figure C above shows the water vapor (left), infrared satellite (middle), and 250mb upper air analysis on 10 December 2014 at 700 AM. The water vapor shows deep advection of Atlantic moisture across New England while the infrared satellite illustrates the colder higher cloud tops indicating the areas of heavy precipitation with surface low pressure near Cape Cod. The 250mb analysis displays a deep negatively tilted trough with favorable upper level divergence (yellow lines) from right rear jet quadrant impacting most of Vermont into the eastern Adirondacks Mountains. The combination of thermal profiles just cold enough to support wet snow in many locations and favorable track of the mid/upper level circulation lead to very heavy precipitation occurring across the North Country.

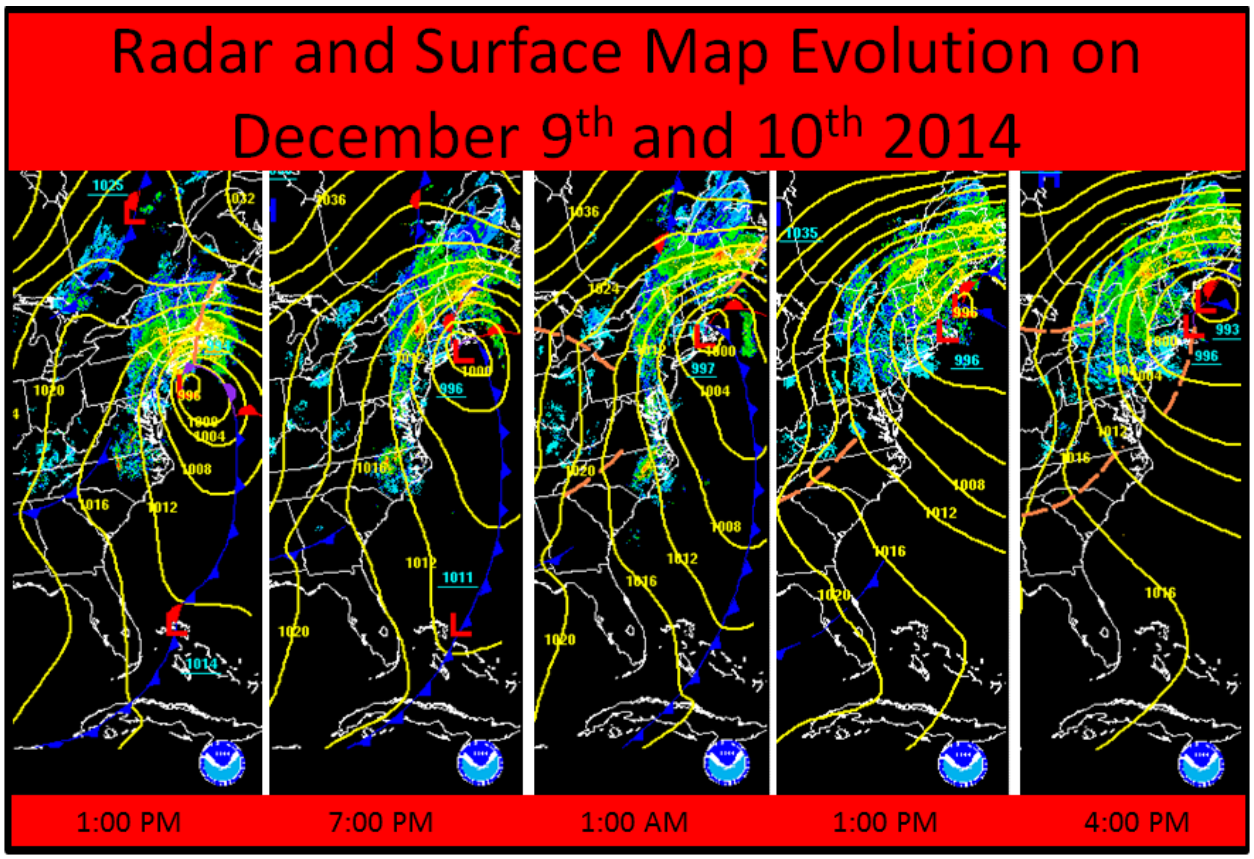

Figure D: Radar and surface map evolution on 9 December from 1:00 PM to 4:00 PM on 10 December 2014.

Figure D above shows the surface low pressure evolution along the northeast corridor, along with associated radar imagery from 1:00 PM on December 9th through 4:00 PM on December 10th. The slow movement of low pressure from coastal New Jersey on December 9th into the Gulf of Maine by the evening of December 10th, lead to several rounds of moderate to heavy precipitation across the North Country. The brighter yellow colors in the radar imagery above shows the areas of heavier precipitation associated with this system. The two day precipitation totals showed a widespread 1 to 3 inches occurred with localized mountain locations receiving up to 4 or 5 inches. The low snow-to-liquid ratios resulted in a heavy wet dense snow, while keeping snow accumulations much lower than if the storm had a snow to liquid ratio around 15 to 1.

Figure E below shows several storm related photos taken several days after the storm. The heavy wet pasty snow stuck to trees and power lines, and was extremely difficult to shovel and plow. In addition to the snow pictures, you can see some significant ice accumulated across the higher terrain near Barnard, Vermont during this event. The combination of heavy snow and ice caused significant power outages across northern New York into Vermont, which lasted for up to a week and produced more damage to the power grid than the January 1998 ice storm and hurricane Irene, making this snowstorm our # 1 weather related event in 2014.

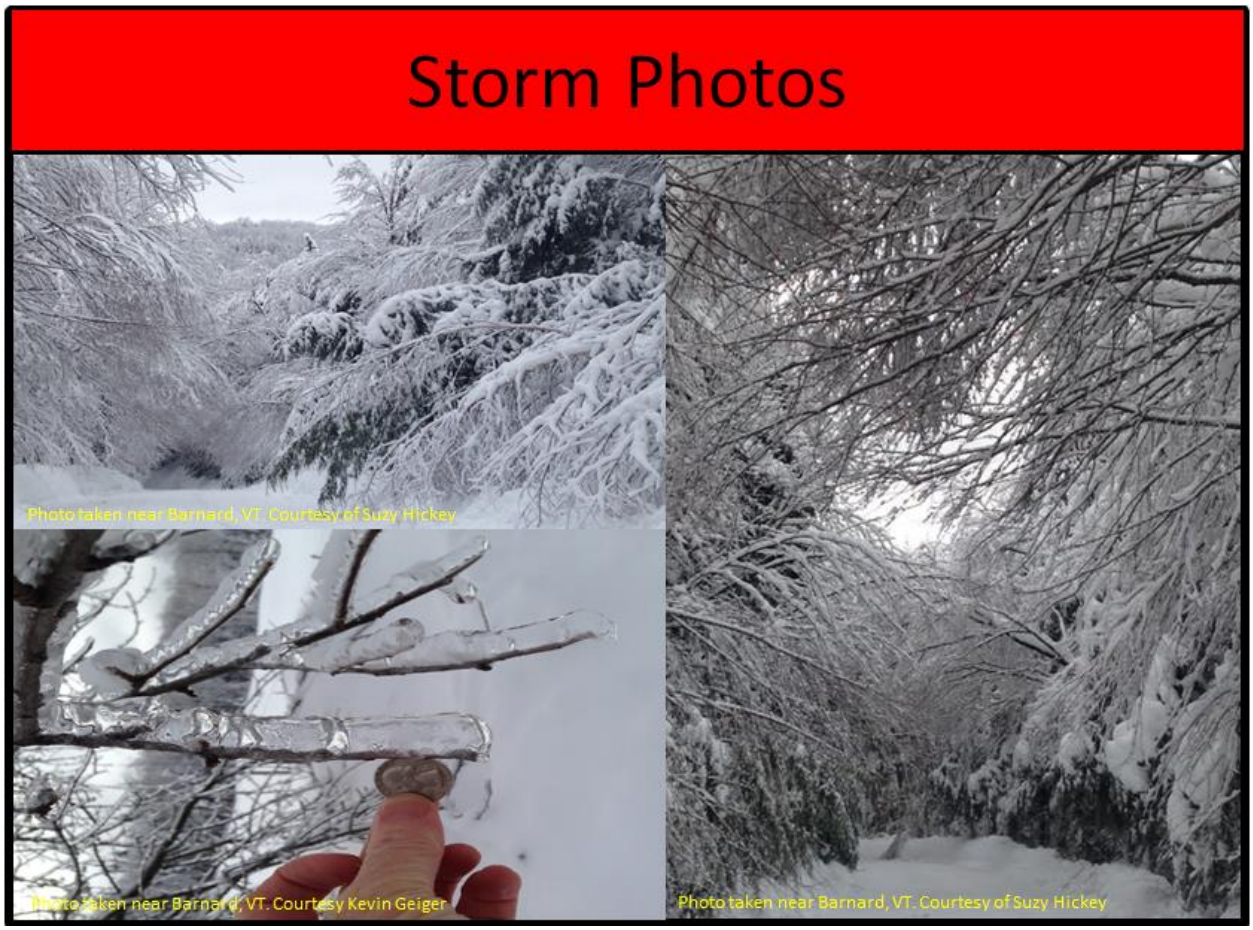

Figure E: Storm photos taken near Barnard, VT.